



Thematic Study on Machine Farm Ponds with Farm Bund-Integrated Watershed Management Programme – Ananthapuramu

PVRM Reddy¹, B Janardha Reddy², BV Ramana Kumar³, R Jhansi Rani^{4*} and Pullanna Vidyapogu⁵

¹Director Watersheds, India

²Joint Commissioner (Watersheds), State Level Nodal Agency, Andhra Pradesh, India

³Chief Executive Officer, India

⁴Programme Manager, India

⁵Consultant-Remote Sensing Instruments, Hyderabad, India

***Corresponding Author:** R Jhansi Rani, Programme Manager, India

Received: October 29, 2020

Published: November 18, 2020

© All rights are reserved by **R Jhansi Rani, et al.**

Abstract

The meaning of Farm pond is small tank or reservoir like constructions, are constructed for the purpose of storing the surface runoff, generated from the catchment area. The farm ponds are the water harvesting structures, solve several purposes of farm needs such as supply of water for irrigation, cattle feed, fish production etc. Farm Ponds are shielding the vagaries of drought and help the farmers to keep their farm activity and provide ability to store water during an occasional rain and use the same to feed water to crops during the dry spells. All these have been evidenced in Ananthapuramu district through watershed intervention.

Keywords: Watershed; Soil Erosion; Groundwater; Precipitation

Ananthapuramu district in Andhra Pradesh has witnessed severe droughts in several places over the past few decades. Insufficient precipitation, groundwater depletion, soil erosion, poor crop yields and deficiency of fodder are the consequences of shortage of annual mean rainfall. This has resulted in uncertain livelihoods which made people to migrate to other areas for employment.

To overcome such situation in future, the integrated watershed management program is launched with an aim to restore the ecological balance by conserving and developing degraded natural resources such as soil, vegetative cover and water conservation and create sustainable livelihoods for asset less.

This programme is being implemented jointly by Central and State Government from 2009-2010 with a funding ratio of 90:10, and subsequently now in a ratio of 60:40.

Several developmental paradigms experimented during the India's post independence era have indicated that for development to be sustainable it needs to be community based with central focus on inclusiveness, gender equity and in consonance with nature's laws. This has led to the concept of watershed as a unit for development and philosophy of area development through integrated approach by converging all developmental programmes under different departments into a comprehensive programme of resource conservation and their optimum use considering resources on one hand and the demands of people on the other. Accordingly, Watershed Development has become central for rural development throughout India.

The Government of Andhra Pradesh being pioneer in the country in conserving natural resources by adopting Watershed approach has created a separate Commissionerate for Rural Develop-

ment for carrying out programme in the entire state in the coming years.

All the criteria proposed by the Department of Land Resource, Government of India have been used for prioritizing the Watershed. Based on this prioritization, more critical one as to be treated on priority. Further, taking into priority ranking given by APSRAC, SC, ST population, percentage of literacy, percentage of agricultural labour, status of groundwater, scarcity of drinking water, quality of drinking water, availability of DWCRA, contiguity with existing watersheds, livestock population, community mobilization etc. About 3,600 watersheds were prioritized into very high, high, medium, low and very low categories across the state. The Ananthapuramu district is declared as hot arid due to high temp., low, erratic and unevenly distributed rainfall resulting in moisture stress. Trends of desertification are also seen in parts of the district. Groundwater levels are alarmingly low and receding fast. Further degeneration of existing marginal and degraded forests is happening in the last four decades and acute scarcity of drinking water, fodder and fuel is occurring in every alternate year which is a serious concern. All these factors are creating tremendous concern and awareness regarding the danger that is looming large among the masses of the district. It is, therefore, essential to develop these areas by adopting appropriate soil and water conservation measures on watershed basis for reducing environmental impacts of droughts. Due to large number of water conservation and water harvesting structures taken up in the dist. during 1993-95, 1000 m.cum of additional groundwater recharge was made possible which is very encouraging and forms a base for evolving a comprehensive watershed development. In this view, the IWMP Watershed has been implemented in the Ananthapuramu district since 2009, with 15 Batch-I Projects, 26 Batch-II Projects and 29 Batch-III Projects and 16 Batch IV Projects, with a total of 86 projects covered since the launch of the project.

Soil and water conservation in the watershed management

Soil and water conservation is the utmost important aspect in the watershed management in this view under the Natural Resource Management works like Soil and Moisture works i.e. staggered contour trenches, Water absorption trenches, sunken pits, loose boulder structures, rock fill dams, Water Harvesting works mini percolation tanks, percolation tanks, check dams, check walls, farm ponds, dugout ponds, injection wells and Afforestation works i.e. Avenue, block plantations, horticulture, greening of hillocks, fodder development works were carried following the ridge to valley approach using 56% project funds. The thematic study on Machine Farm Ponds emphasized on the impact and results in Ananthapuramu district.

Objectives of the study

- The thematic study aims to understand the outcomes and effects of machine farm ponds with farm bund in the Ananthapuramu for Batch-III to Batch-IV.
- To analyze the number of Machine Farm Ponds with Farm Bund which were spent in the period 2011-12 and 2012-2013.

Area of the study

The thematic study focuses on the Ananthapuramu for Batch-III and Batch-IV.

Initiation of farm ponds in the watershed management

As mentioned above, numerous watershed works have been built for the conservation and protection of rainwater. The Farm Ponds played a very important role in the preservation and conservation of rainwater in the Ananthapuramu district. The farm ponds structures provide localised water and food security by enhancing the crop productivity and climate resilience. Moreover, farm ponds conserve the natural resources like soil and nutrients apart from water and acts as flood control structure by reducing peak flows in the watersheds or given area of catchment. Keeping all in the view, the farm ponds construction was taken up in all the projects in Batch-I projects and found excellent results and impacts out of these structures. Initially all the farm ponds were built with the manual construction for the 1st batch of watershed and it was found very useful and GOAP-Department of Watershed decided to create the machine farm ponds with the farm bund and modified few design aspects to keep in the more storage and use of water.



Figure a

The machine farm ponds with Farm Bund have been found very excellent results in Ananthapuramu district, majority of the farmers in the villages came forwarded to have the farm pond in their filed. The following table explains about the difference between usefulness and cost effective of manual and machine farm ponds in Ananthapuramu district from Batch-I to Batch-IV.

Subject	Manuel Farm Pond	Machine Farm Pond
Batches covered	Batch-I and Batch-II	Batch-III and IV
Financial Support	Convergence with MGNREGS	Completely funded by the IWMP
Constructed by	Manuel labour	Machine
Type of Farm Pond	Single Farm Pond	Farm Pond with Bund
Size	2 meters	3 meters
Cost	More Manuel cost nearly expenditure of Rs.1-2 Lakhs as lab our cost is very high	Very cost effective, expenditure is around Rs.1 lakh and very cost effective comparatively man made

Meaning of farm ponds

Farm ponds are small tank or reservoir like constructions, are constructed for the purpose of storing the surface runoff, generated from the catchment area. The farm ponds are the water harvesting structures, solve several purposes of farm needs such as supply of water for irrigation, cattle feed, fish production etc. Farm ponds also play a key role in flood control by constructing them in large numbers in the area. In addition, the farm ponds are also used for storing the monsoon water, which is used for irrigation of crops, and several other purposes, according to the need. A farm pond also has significant role in rainfed farming. The farmers have been very attracted towards the farm ponds in the watershed villages as it has been giving very good results for the farming community.

Purpose of the machine farm ponds

The stored water used for agricultural fields not only to harvest but also to use the fertilizers. Income levels raised by growing vegetables. Horticulture crops harvested by plastering with clay at the underground of the farm pond. The farm ponds also helped in recharging of ground water table of bore wells and open wells that are surrounded by. Precipitation of water level increased due to storage of water in the ponds which helped for the growth of crops even in the conditions of low rain fall.

Site selection for the machine farm ponds

- Farm ponds can be construct where farmers have at least two acres of agricultural field
- It can be construct at the low-lying area where water collects.

Process of construction of Farm Ponds

- This was constructed under the MNREGS program initially under watershed programme, now completely under the IWMP

- The measurements of farm pond taken up by consulting farmers and with their consent
- The work where water collects from every corner
- The works done by giving marking
- The design of farm pond estimations has been strictly followed
- Plantation also taken around the bund and farm pond.

Planning of farm ponds

Farm Pond is a dug-out structure with definite shape and size having proper inlet and outlet structures for collecting the surface runoff flowing from the farm area. It is one of the most important rainwater harvesting structures constructed at the lowest portion of the farm area. The stored water must be used for irrigation only. A farm pond must be located within a farm drawing the maximum runoff possible in a given rainfall event. A percolation pond can be dug out in any area where the land is not utilized for agriculture.

Types of farm pond

There are generally two types of farm ponds followed in the watershed majorly excavated type of farm ponds constructed in the individual farmers filed.

- Embankment type farm ponds
- Excavated or dug out type.

Embankment type

Embankment type farm ponds are generally constructed across the stream or water course. Such ponds consist of an earthen embankment, which dimensions are fixed based on volume of water to be stored, mainly. These farm ponds are usually constructed in that area where land slope ranges from gentle to moderately steep; and also, where stream valleys are sufficiently depressed to permit a maximum storage volume with least amount of earthwork.

Dug out type farm ponds are constructed by excavating the soil from the ground, relatively in flat areas. The depth of pond is decided on the basis of its desired capacity, which is obtained almost by excavation. The use of this type of pond is suitable, particularly where a small supply of water is required.

- Reduces water flow and reduces soil erosion
- Emergency water supply to a limited area
- Provides water for spraying pesticides
- Cultivation of vegetables and farming of fisheries
- Provides drinking water to animals
- Indirectly groundwater rises

- Collect the basic data of the area concern, i.e.
 - Rainfall, evaporation, temperature etc.
 - Topography
 - Livestock etc.
- Estimate the required storage capacity of pond. It is determined based on the livestock. Normally, the bigger live stocks such as cattle require about 1 acre-ft/year per 75 heads and small livestock like sheep, goat require about 1 acre-ft/year for per 750 heads. The volume of water likely to lost through evaporation and seepage, plus about 10% more to adjust some unforeseen water losses from the pond, is also added to determine pond storage capacity.
- Determine the catchment area of the farm pond to satisfy the required storage. It is performed by use of topographic map of the area.

- Pondage or storage area
- Earthen embankment
- Mechanical and emergency spillways.

On the other hand, the emergency spillway is used as safeguard for earthen dam against overtopping, when volume of inflow becomes greater than the pondage capacity of the farm pond.



Figure b: Construction of Farm Pond

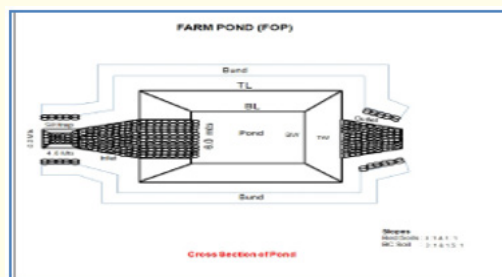


Figure c: Cross section of Farm Pond with Farm Bund

A farm pond should be protected against erosion, wave action, livestock and other sources of damage. Ponds without such protections have short life and high cost of maintenance.

In general, the exposed surfaces of the dam, spillways, berm areas and other surfaces are badly damaged due to soil erosion. These can be checked by establishing a good cover of sod-forming grasses. The planting of grasses should be done based on the local guidelines.

Time to time there should also be used the measures for protection of earth dam against wave action.

The Watershed Committee determines the farmers filed and the Technical Officer calculates the estimate by taking into account the

various technical aspects such as the farmers field stream order, soil type, soil composition, expected area irrigated area, etc. The estimates were uniformly generated by the common software at the watershed computer center where the administrative approval is obtained by Technical Officer/Engineer and Project Officer. Each of the farmers' data entered before the work was finished and request administrative approval after receiving work approval, the work executed in the respective farmers was filed. The estimation of Machine Farm Pond with Farm Bund as follows;

- Earth work excavation in all kinds of soils with an initial lead of 10m and initial lift of 2mts for silt trap
- Earth work excavation in all kinds of soils with an initial lead of 10m and initial lift of 2mts for inlet, outlet
- with an initial lead of 10m and initial lift of 2mts for Toe Wall and Revetment portion of Main Pond
- Earth work excavation with machine in all kinds of soils for pond with an initial lead of 10 mts and initial lift of 3 mts etc., complete
- Conveyance of excavated earth upto a lead of 1Km for formation of Farm Bund
- Charges for rolling in layers by 2T roller bar cattle trading including watering, necessary leveling and sectioning for formation of farm bund
- Earth work excavation with machine in all kinds of soils for pond with a lead beyond 10 mts and upto 50 mts and lift upto 3 mts etc., complete.
- Rough stone dry packing charges of 225 mm HBG variety including cost of material
- Name Board
- Conveyance for 225mm rough stone including loading and unloading
- Cost of seigniorage charges for Rough Stone 225 mm.

Construction of farm bund on farm pond has to be done 2 meters away from the burm and silt trap need to construct to water stream downside at the outlet. Inlet, outlet and silt trap must be pitched with 9 inches with stones. The storage of water based on the size of the Farm Pond constructed in the field.

For Example, 8 X8 measurements (8+4 X8+4X2) = 72 cubic meters of water store

1 cubic meter water = 1000 liters

According to the above measurements (72*1000) = 72000 liters of water stored

Things cannot be done

- Construction of farm pond cannot not be done without farmer's consent
- No work has to be done without farmer's permission
- Farm pond cannot be built without silt trap
- Soil that dug up cannot be pour against the inlet and outlet
- Not to be constructed without burm
- Revetment cannot be done without toe wall
- Farm ponds cannot be construct in sand soils
- Bund cannot be form without sectioning and consolidation
- Without wall construction cannot be taken up

Machine farm ponds in ananthapuramu district

The IWMP programme initiated in 2009 in Ananthapuramu district in 15 projects (Batch-I) and later expanded in 26 projects (Batch-II) in 2009, 29 projects (Batch-III) in 2011 and 16 Projects (Batch-IV) in 2012 which was ended up 2019-20. All the projects were covered various works. Presently the report emphasized on Machine farm Ponds and its impact and results.

Photos of machine farm ponds with farm bund



Figure d

Name of the batch	Batch -I	Batch -II	Batch -III	Batch -VI
Year of implementation	2009-10	2010-11	2011-12	2012-13
Total number of projects implemented	15	26	29	16
Total MWS	75	116	126	66
Total habitations		300	324	164
Total Ha covered under watershed	59,205	1,01,337	1,24,506	67,384

Table 2: Watershed Implementation in Ananthapuramu District – Batch Wise.

The Major Machine Farm Ponds with Farm bund has been taken up in the Batch-III and IV projects. The Batch-III is having 29 projects located in 29 mandals and sub divided into 126 micro-watersheds. These micro-watersheds spread over 324 habitations in the district and are having 52,097 households. All these 29 projects were monitored under the 9 WCC (watershed computer Centers) by the Project Officer, Technical Officer/Engineer and other staff of watershed.

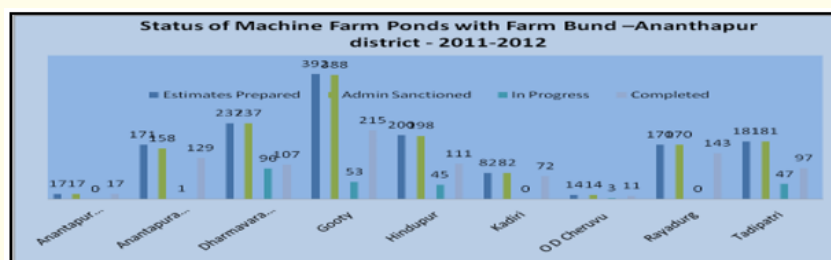
Status of machine farm ponds with farm bund -Ananthapuramu district 2011-12

Status of machine farm ponds in the district of Ananthapuramu for the year 2011-12 explained in the below table. There are 9 Watershed Computer Centres (WCC) in Ananthapuramu district which have contained 29 watershed projects of Batch-III who monitors the all the aspects of watershed management. The total number of Machine Farm Ponds with Farm Bund estimated for the 9 WCC is 1464 and the total sum estimated as 1442.84 lakhs and the administrative approval for the same was approved. Totally 245 (17 percent) farm ponds were undergoing progress and 76.83 lakhs incurred expenditure and 902 Machine Farm Ponds (61.6 percent) have been completed so far, with 560.62 lakhs providing financial support.

In these, Gooty WCC marked high in utilizing Machine Farm Ponds with Farm Bund 392 with financial assistance 388 lakhs and there are 53 works are in progress and completed are 215. This followed by Dharmavaram WCC as 237 lakhs for 237 Machine Farm Ponds with Farm Bund and 96 works are in progress and 107 are the completed works. The lowest among 9 WCC shows that as O D Cheruvu WCC where Machine Farm Ponds with Farm Bund marked as 14 for 14 lakhs and 3 are in progress and 11 are completed.

S. No	WCC	Estimates Prepared		Admin Sanctioned		In Progress		Completed	
		Physical	Financial (Lakhs)	Physical	Financial (Lakhs)	Physical	Financial (Lakhs)	Physical	Financial (Lakhs)
1	Ananthapuramu	17	12.40	17	12.40	0	0	17	7.81
2	Ananthapuramu – 2	171	172.54	158	158.85	1	0.85	129	88.21
3	Dharmavaram	237	219.51	237	219.51	96	37.36	107	62.26
4	Gooty	392	410.13	388	405.95	53	12.34	215	117.65
5	Hindupur	200	188.71	198	186.62	45	14.40	111	76.19
6	Kadiri	82	85.76	82	85.76	0	0	72	56.79
7	O D Cheruvu	14	15.41	14	15.41	3	0	11	0.85
8	Rayadurg	170	164.92	170	164.92	0	0	143	80.02
9	Tadipatri	181	173.45	181	173.45	47	11.88	97	70.83
	Grand Total	1464	1442.84	1464	1442.87	245	76.83	902	560.62

Table 3: Status of Machine Farm Ponds with Farm Bund -Ananthapuramu District 2011-12



Graph 1: Status of Machine Farm Ponds with farm Bund – Ananthapuramu 2011-12.

Status of machine farm ponds with farm bund - Ananthapuramu district 2012-13 (Batch-IV Projects)

Status of machine farm ponds in the district of Ananthapuramu for the year 2012-13 explained in the below table. There are 7 Watershed Computer Centres (WCC) in Ananthapuramu district which have contained 16 watershed projects, 66 micro watersheds which covered 164 habitations. The total machine farm ponds with farm bund works estimated to take up in the 7 WCC are 998 and the total amount estimated as 1012.95 lakhs.

The actual Machine Farm Ponds with Bund sanctioned are 900 and the total amount sanctioned is 912.41. With this, the status

of Machine Farm Ponds that are in progress shows as 393 and financial support provided for these are 93.14 lakhs. The total of 43 completed Machine Farm Ponds and the financial support provided for this is 26.79 lakhs.

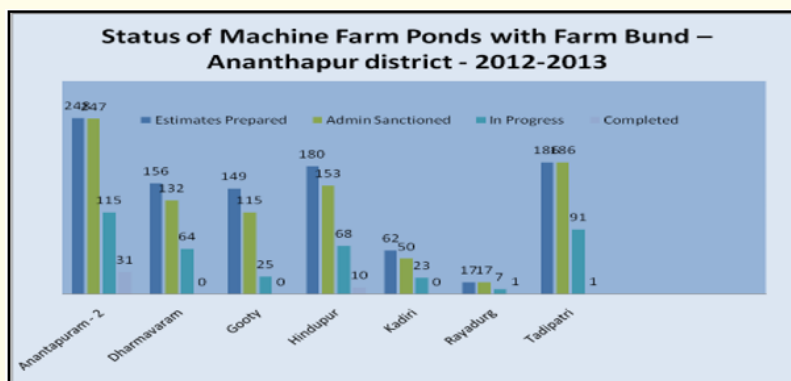
In these, Ananthapuramu-2 marked high in utilizing Machine Farm Ponds with Farm Bund 248 with financial assistance of 247 lakhs and there are 115 works are in progress and completed are 31. This was followed by Tadipatri as 187 lakhs for 186 Machine Farm Ponds with Farm Bund and 91 works are in progress and the completed works are 1. The lowest among 7 WCC is Rayadurg where Machine Farm Ponds with Farm Bund marked as 174 for 17 lakhs and 7 are in progress and the completed works are 1.

S. No	WCC	Estimates Prepared		Admin Sanctioned		In Progress		Completed	
		Physical	Financial (Lakhs)	Physical	Financial (Lakhs)	Physical	Financial (Lakhs)	Physical	Financial (Lakhs)
1	Ananthapuramuam - 2	248	254.91	247	253.87	115	28.34	31	23.46
2	Dharmavaram	156	152.54	132	128.72	64	22.29	0	0
3	Gooty	149	156.29	115	120.22	25	5.86	0	0
4	Hindupur	180	173.50	153	146.31	68	17.39	10	2.54
5	Kadiri	62	64.65	50	52.23	23	0.68	0	0
6	Rayadurg	17	17.19	17	17.19	7	3.41	1	0
7	Tadipatri	186	193.88	186	193.88	91	15.16	1	0.78
	Grand Total	998	1012.95	900	912.41	393	93.14	43	26.79

Table 4: Status of Machine Farm Ponds with Farm Bund -Ananthapuramu dist -2012-13.

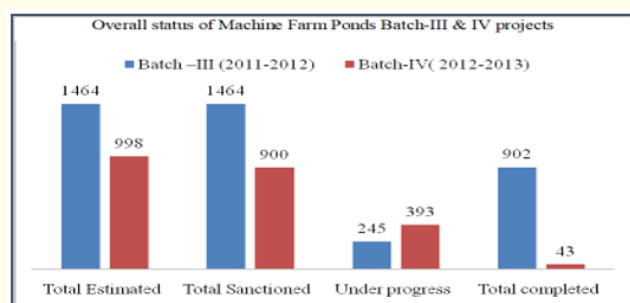
Name of the Batch	Total Estimated	Total Sanctioned	Under progress	Total completed
Batch -III (2011-2012)	1464	1464	245	902
Batch-IV (2012-2013)	998	900	393	43
Total	2462	2364	638	945

Table 5: Overall status of Machine Farm Ponds Batch-III and IV projects.



Graph 2: Status of Machine Farm Ponds with Farm Bund – Ananthapuramu district – 2012-2013.

According to the demand of Machine Farm Ponds with Farm Bund, 2364 Machine Farm Ponds were sanctioned for 45 projects of 192 MWS villages by IWMP – Ananthapuramu. The total of 945 (40 percent) Farm Ponds machine was built and found to be very effective and useful to farmers, and 638 (27 percent) Farm Ponds are under construction at different parts of the projects.



Graph 3: Overall status of Machine Farm Ponds Batch-III and IV projects.

Overall results of the machine farm ponds

The results and impact of the machine farm ponds were identified by direct interaction with the farmers on selective sampling during the field visits and collected case studies. It is found good impact on critical irrigation of crops, growing of vegetable crops and also used for the horticulture irrigation. The farmers were explained that these structures are useful for their irrigation and found the result of increased crop yield.

Conclusion

As a result of Machine Farm Ponds enhanced water availability in the bore wells by 3 to 4 months facilitating critical irrigation. Land use change has taken place in all the projects in terms of in-

creased area under cultivation, irrigation and horticulture through the machine Farm Ponds and the majority of farmers are interested in constructing the Machine farm Ponds in their farm filed. All of these have contributed to an increase in average household income leading to economic stability at the household level. This clearly shows that the watershed ensures the conservation of the resource resulting in an increase in output which ultimately contributes to economic stability.

Bibliography

1. Adhikari RN., *et al.* "Dugout farm pond- A potential source of water harvesting in deep black soils in deccan plateau region". (2009).
2. "Rainwater harvesting and reuse through farm ponds, Proceedings of national workshop cu brain storming". CRIDA. Hyd.
3. Anonymous. Handbook of hydrology. Ministry of Agricultural and Co-operatio New Delhi (1972).
4. Bharat R Sharma., *et al.* "Estimating the potential of rainfed agriculture in India: Prospects for water productivity improvements". *Agricultural Water Management* 97(2010):2-330.

Assets from publication with us

- Prompt Acknowledgement after receiving the article
- Thorough Double blinded peer review
- Rapid Publication
- Issue of Publication Certificate
- High visibility of your Published work

Website: www.actascientific.com/

Submit Article: www.actascientific.com/submission.php

Email us: editor@actascientific.com

Contact us: +91 9182824667